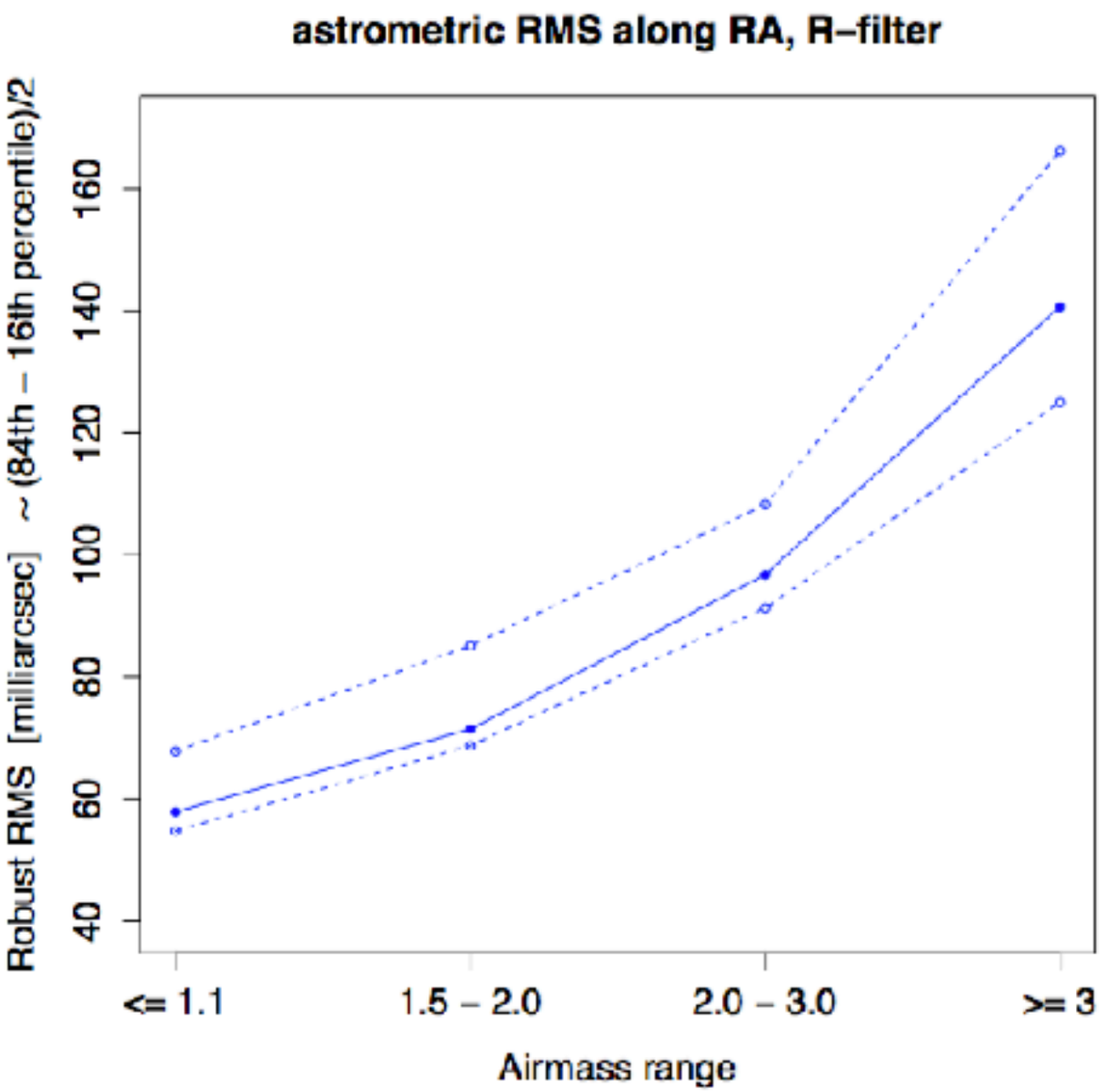
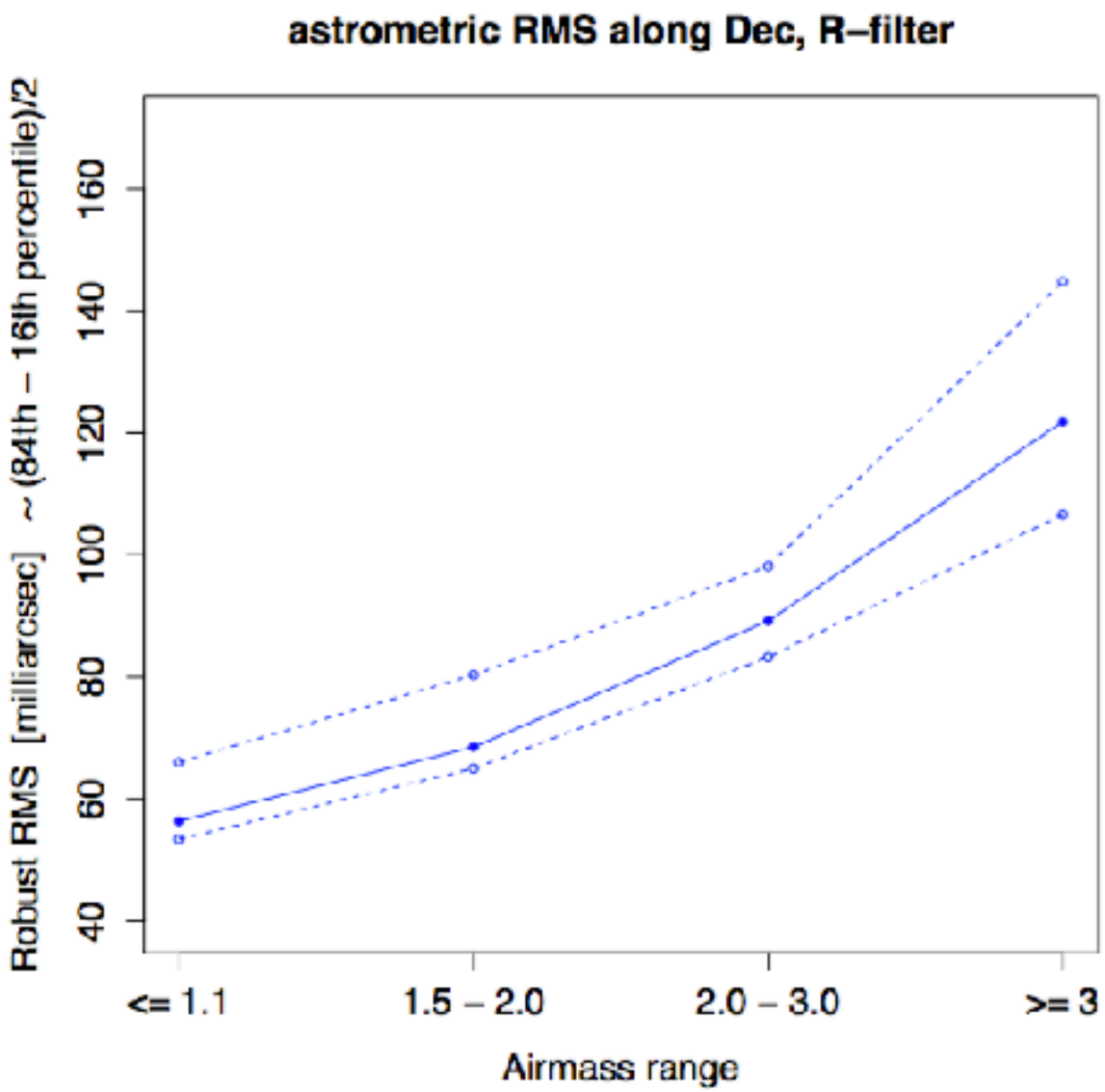
Commissioning results and Galactic science with ZTF

Thomas Kupfer on behalf of the
Galactic science (M31) working group

Astrometry

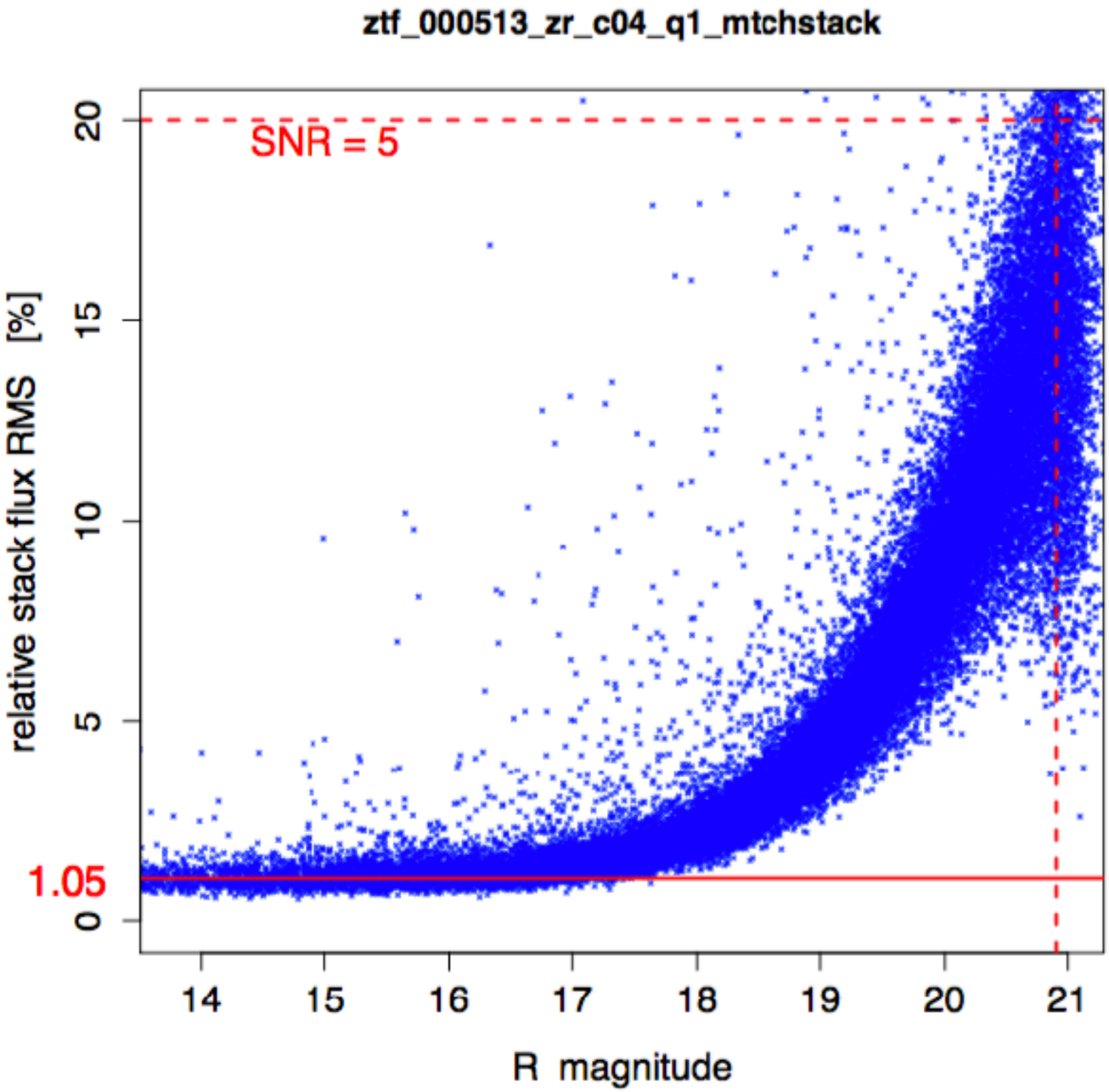
- For airmass range 1 – 2 (survey area), median RMS in R is ~ 55 to 80 mas per axis
- Not correlated with Galactic latitude





Galactic Plane field

- About 70 000 - 100 000 targets per quadrant
- A few million sources per exposure



Commissioning results

Deep drilling fields (observed continuously for about 2 hrs):

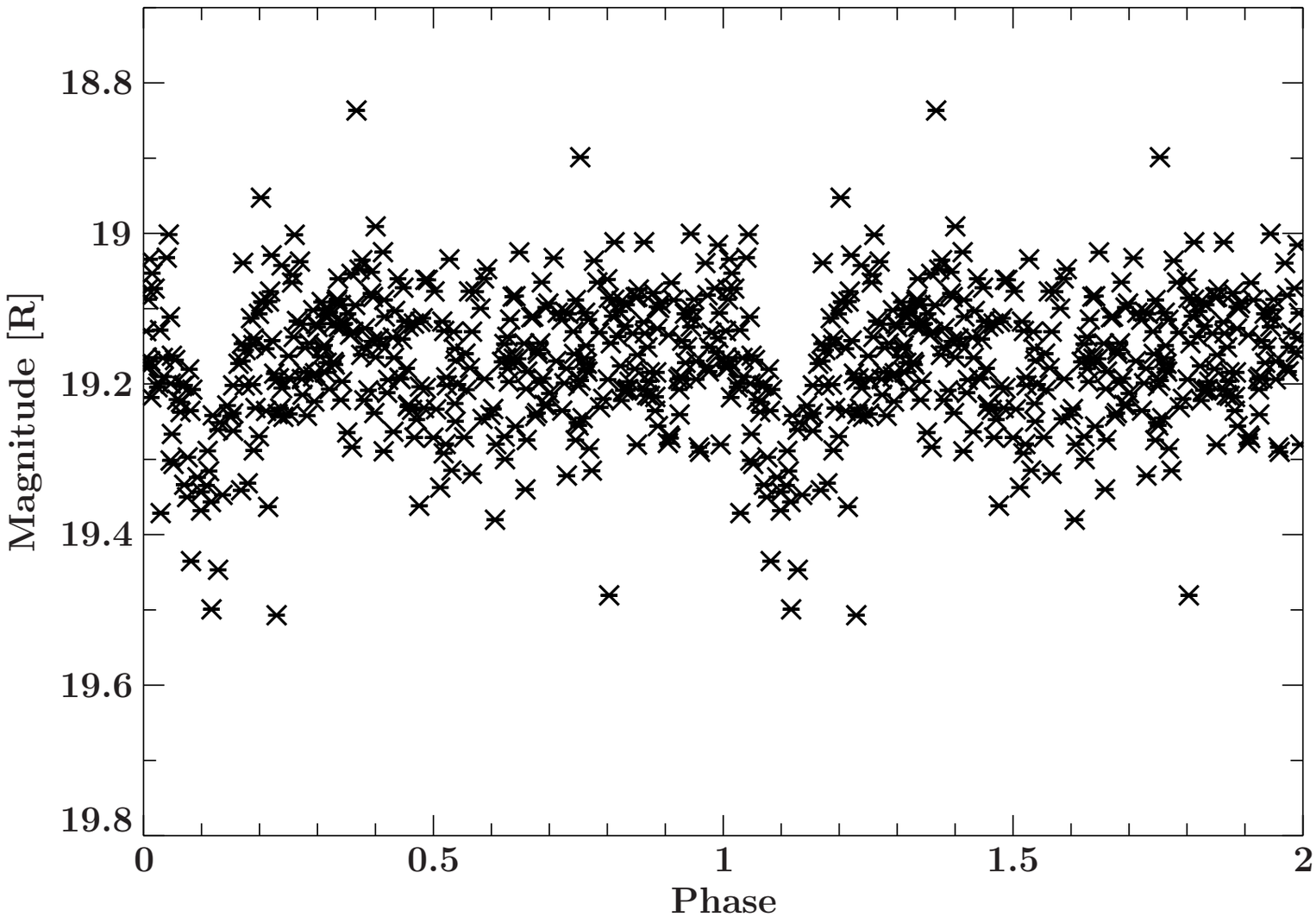
- Low Galactic latitude: #411, #658
- Orion: #1458
- Intermediate Galactic latitudes: #1658

Monitoring fields:

- Low Galactic latitudes: e.g. #612
- Low to high Galactic latitudes: Stripe82

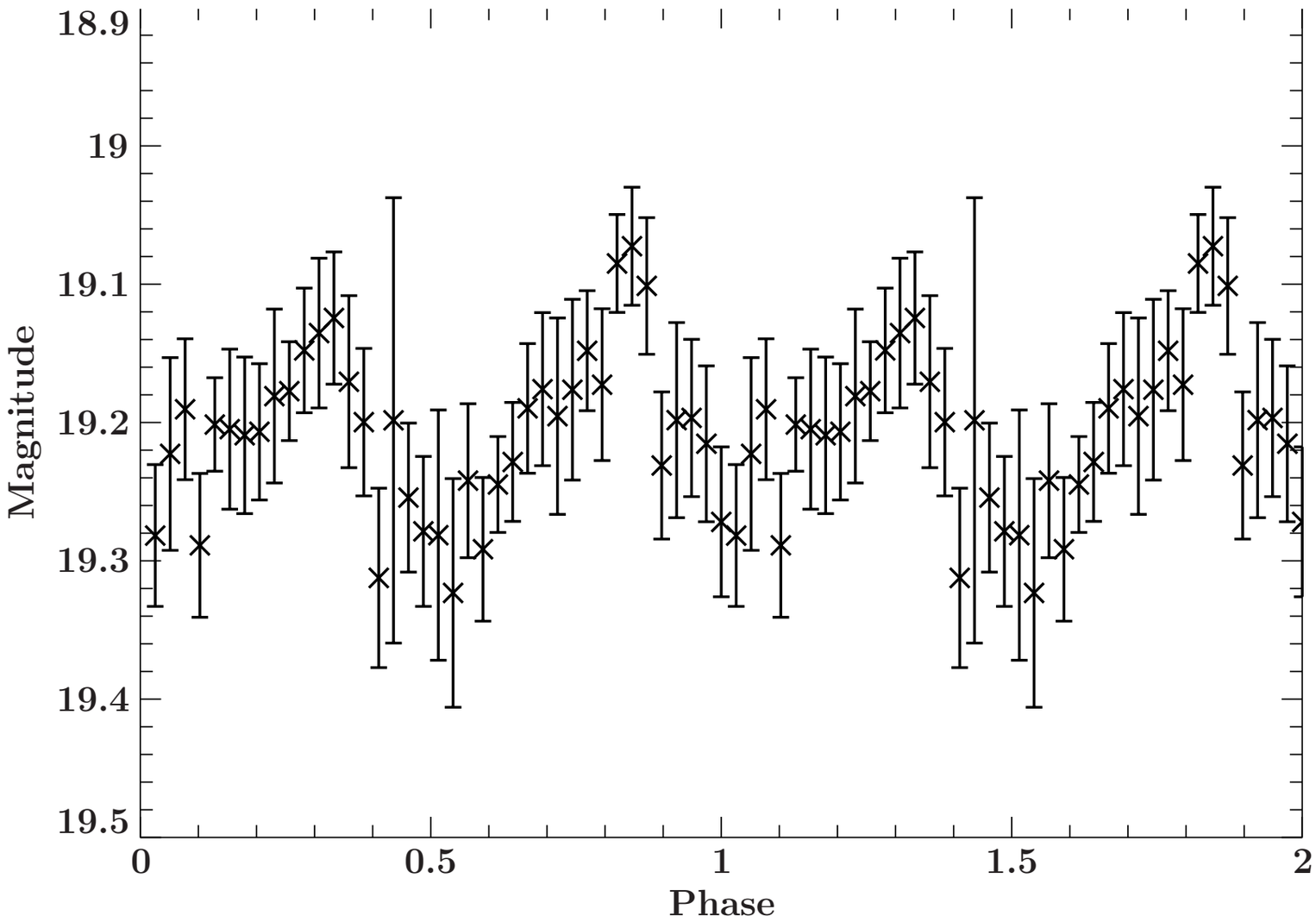
Commissioning results #1658

- field with about 7000 sources per quadrant
- one of the first fields observed (early November 2017)
- observed continuously for about 2 hours
- contains a known eclipsing 12min binary.
- most significant periodic object in an independent period search



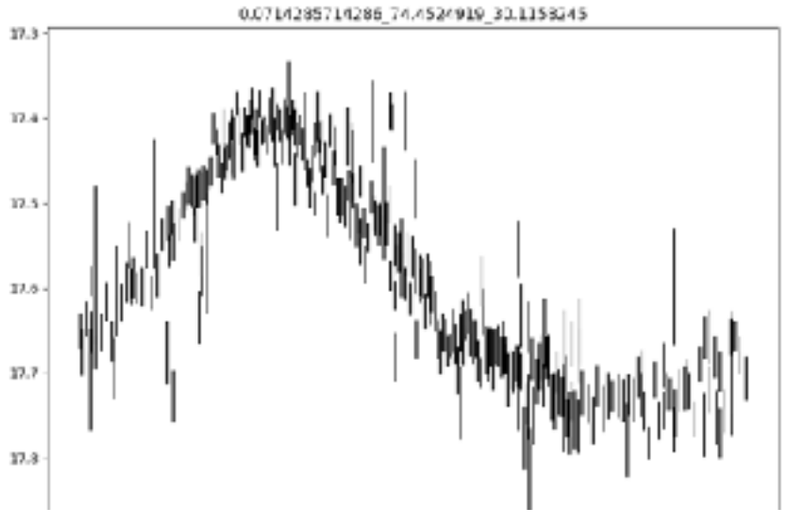
Commissioning results #1458

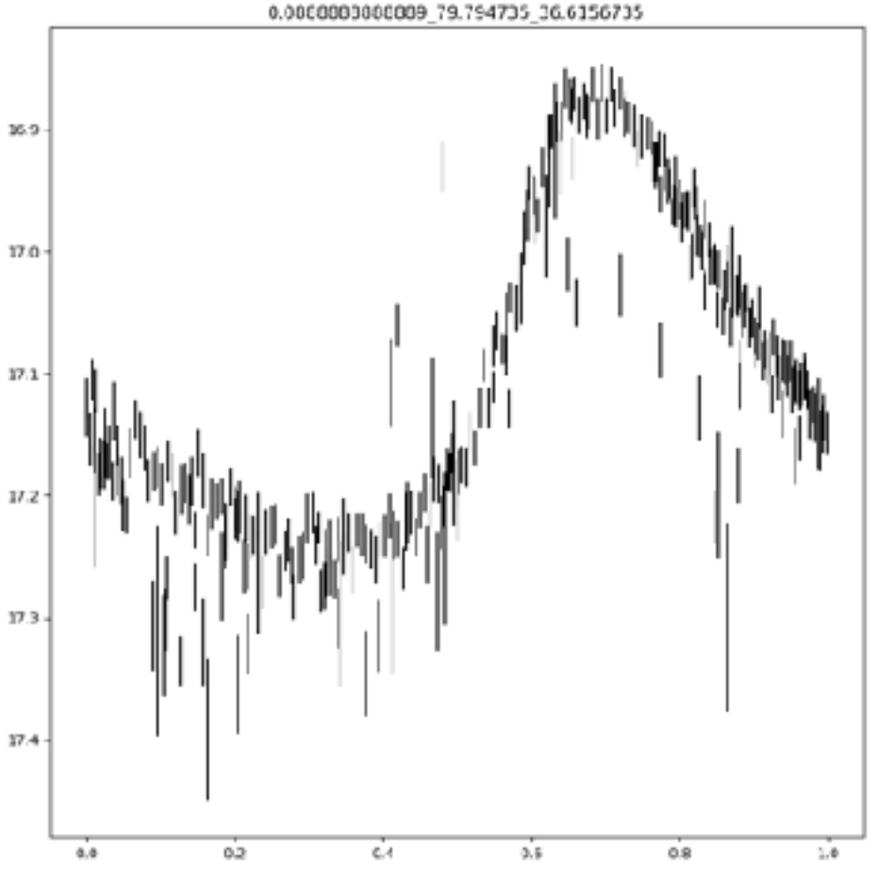
- Field close to the Orion nebula
- 170 subsequent epochs (2 hours) with 3-4 arcsec FWHM
- contains a new not eclipsing 20min binary.
- Low amplitude variability is clearly visible

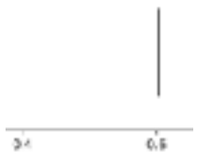


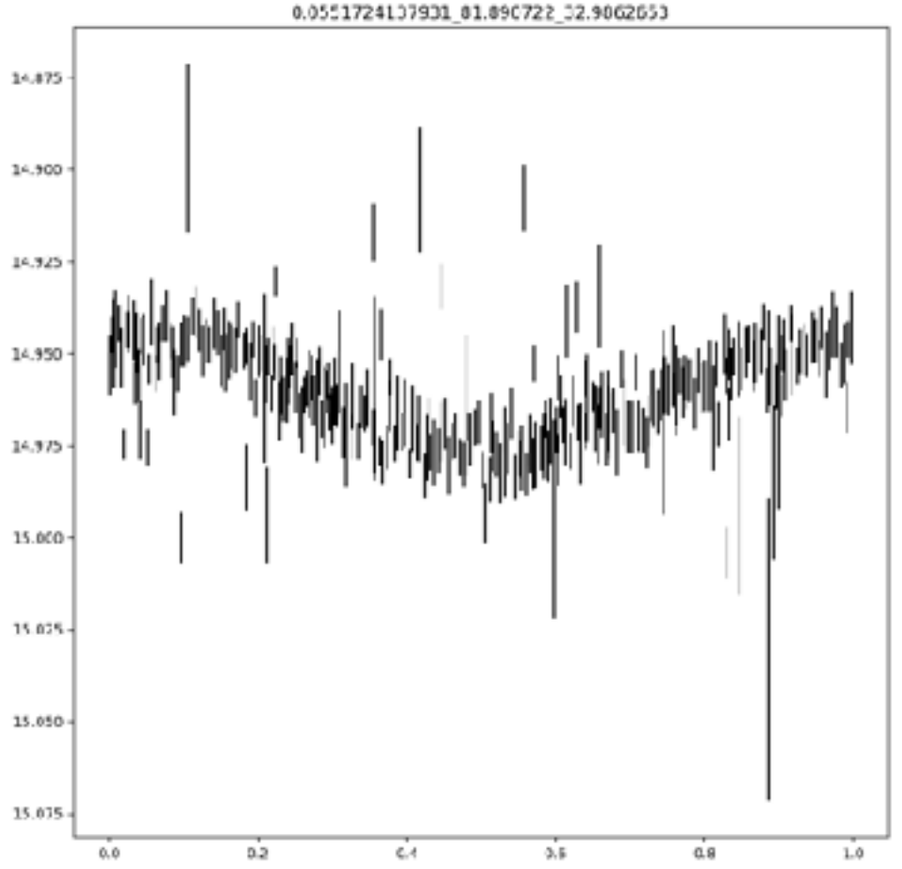
Commissioning results #658

- Low Galactic latitude field: about 12000 sources per quadrant
- several hundred short periodic objects per quadrant



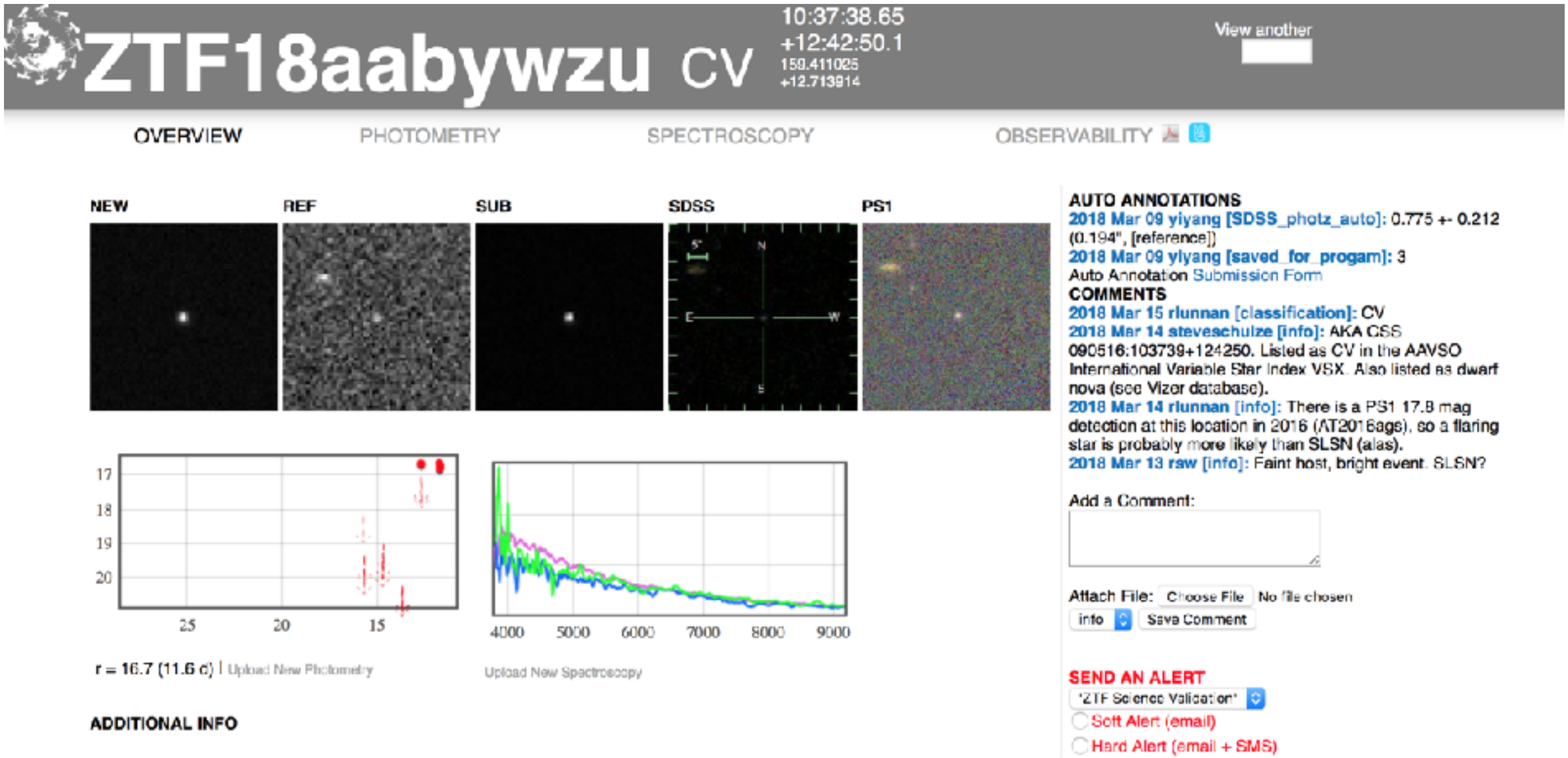






Galactic transients from commissioning

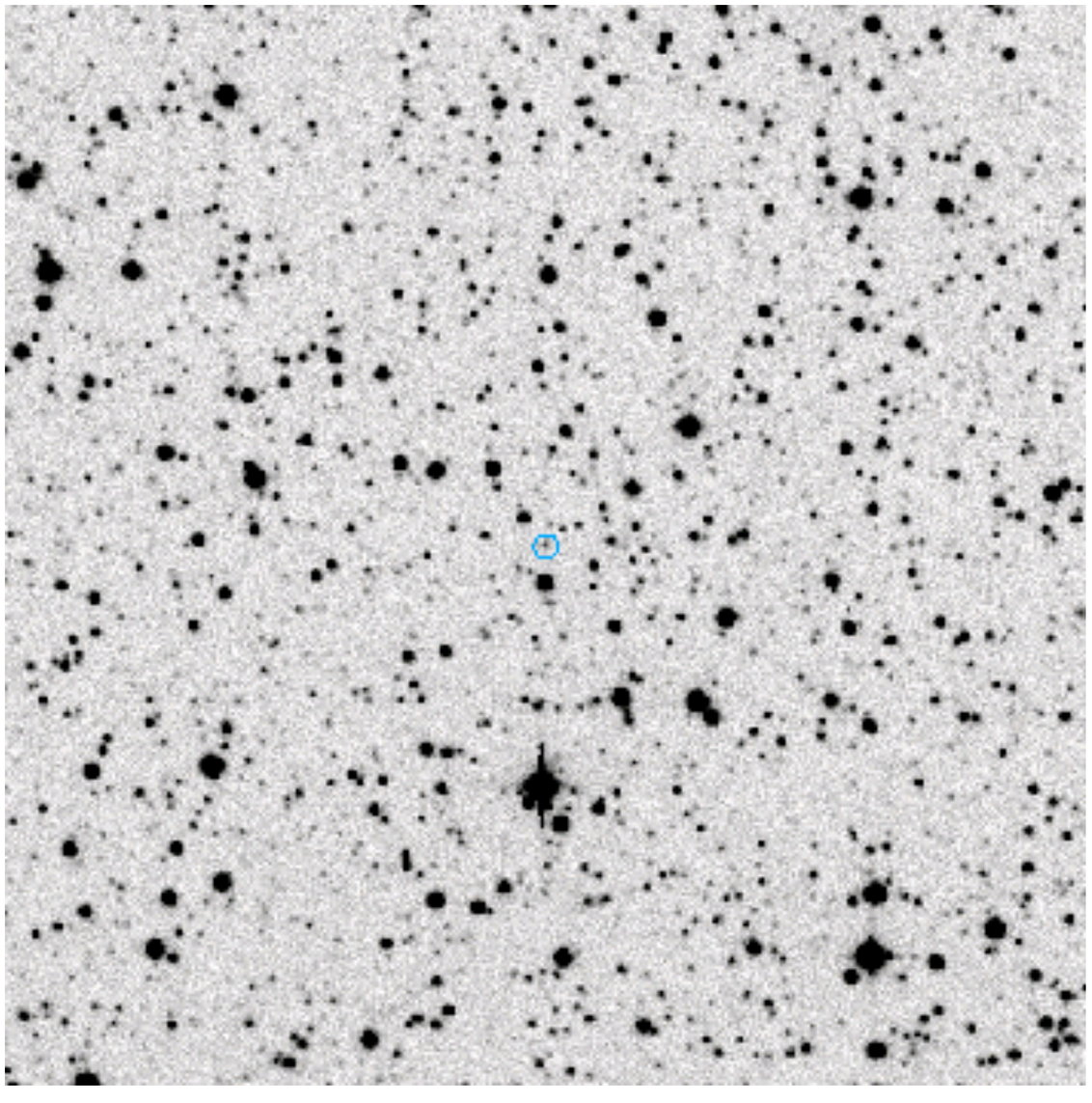
- No detailed scanning from the Galactic group during commissioning
- A few outbursting CVs have been detected



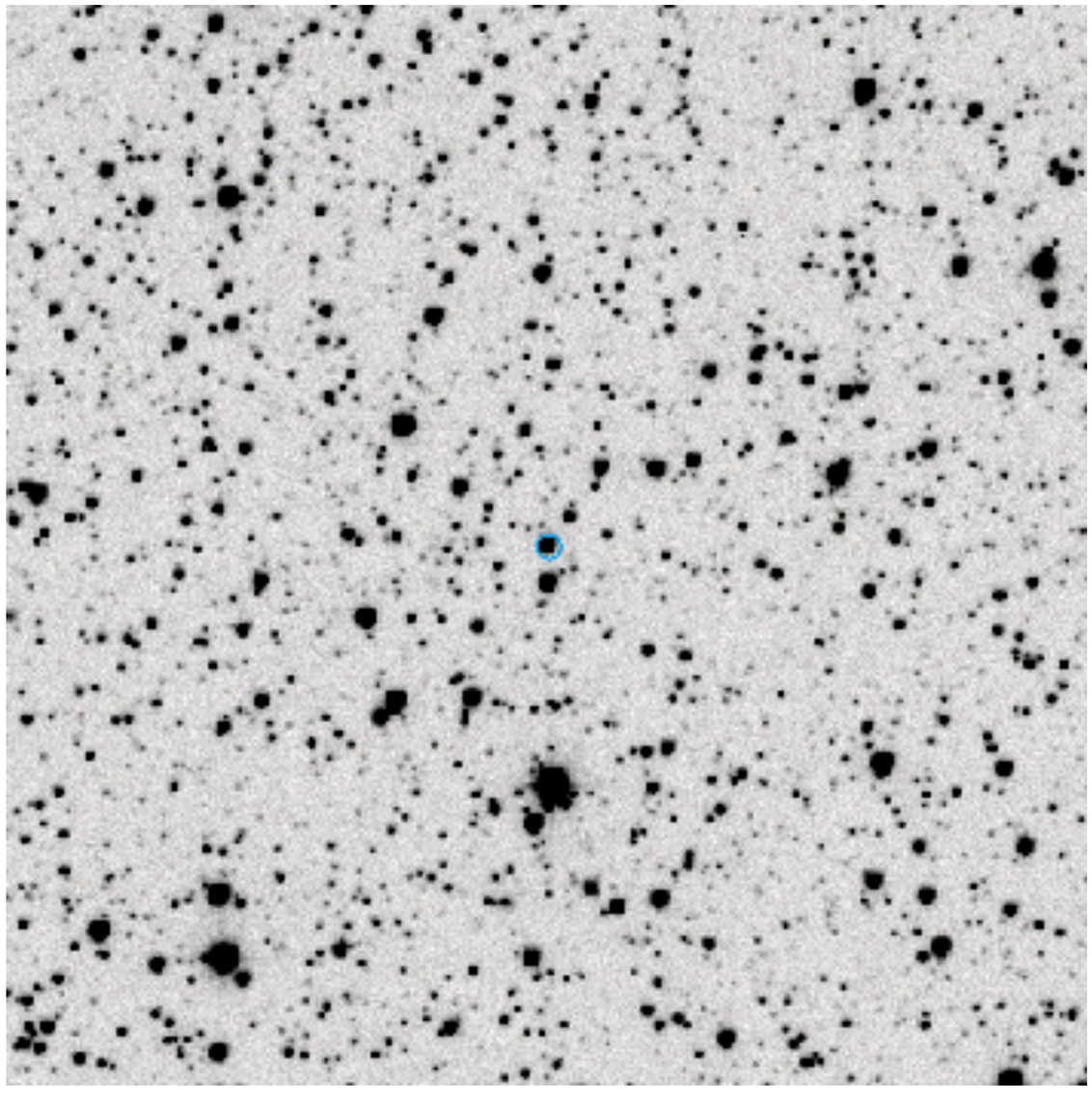
A new Galactic binary with a black hole accretor

- ASASSN reported a transient on March 6th
- MAXI reported an X-ray transient at the same position

PTF (18.5mag)

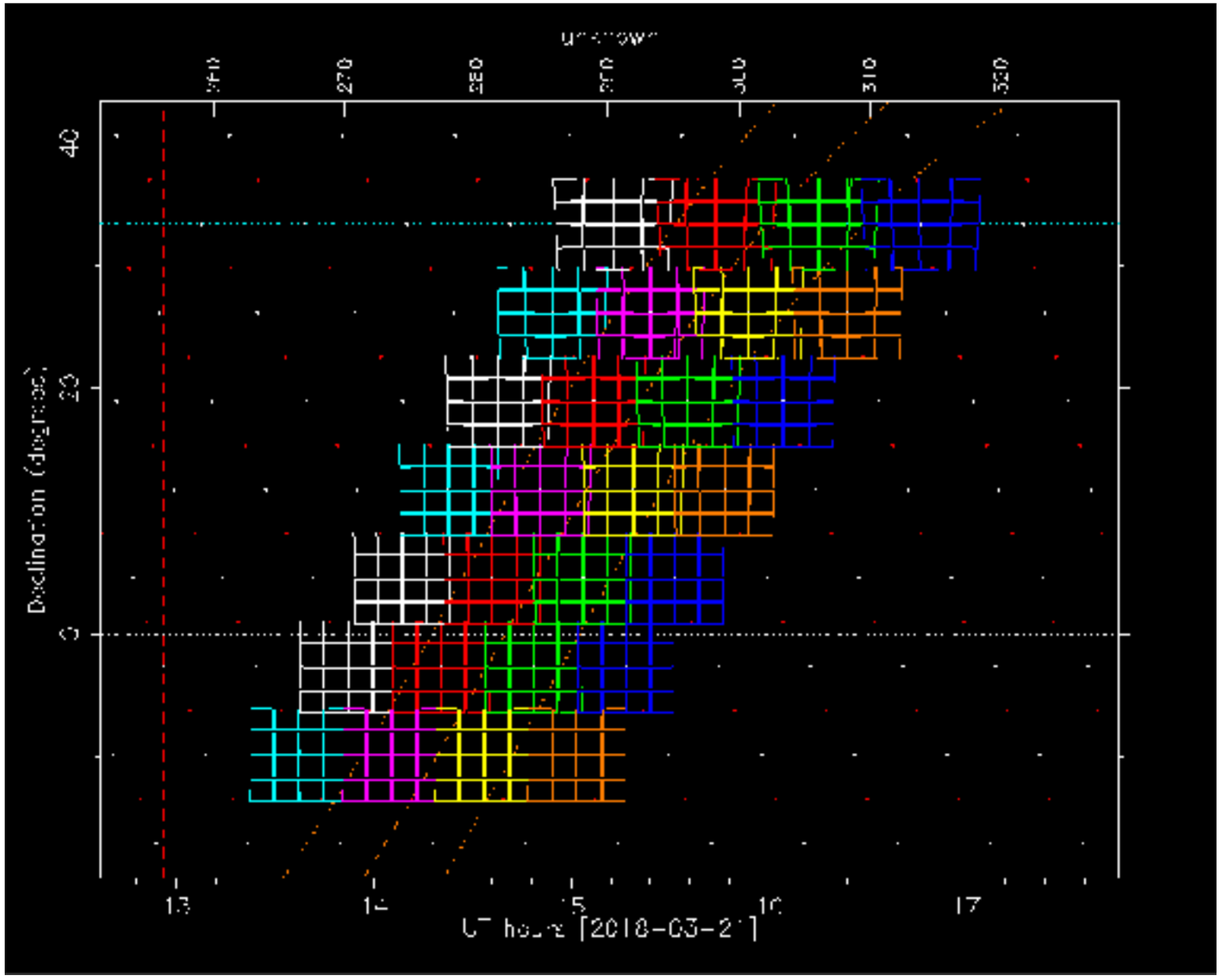


ZTF March 5th (15.1 mag)



Field selection for the August high-cadence survey

- Two possible strategies:
    1. Stay on one field for the 2-3 hours
    2. Alternate between two fields for 2-3 hours



- e.g. (detached, semi-detached) white dwarfs, He-star binaries, NS binaries, ultrafast transients

Filters for Galactic Transients

- **Statistical sample of outbursting CVs:**
  - Fast rising
  - Amplitude of a few magnitudes
  - blue transient
  - decline within a few days to ~2 weeks

- **Dropouts (e.g. eclipsing white dwarfs):**
  - previous detection
  - negative transient
  - possibly completely dropout in one epoch

- **Young stellar objects**
  - Filters TBD

ZTF as time domain resource at low Galactic latitudes

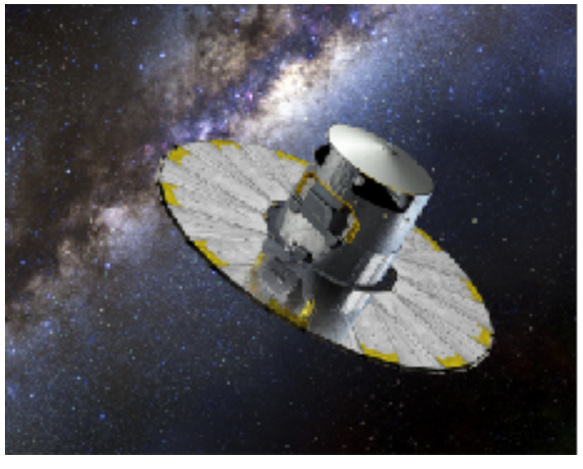
color selection
e.g. PanSTARRS

ZTF will be time domain resource at low Galactic latitudes

this allows for the first time to find and study an unbiased population of periodic/transient variable objects at low Galactic latitudes

time domain data

distances &
proper motions
Gaia DR2



e.g.

- compact binaries
- Young stellar objects
- Galactic Transients

<u>Intersted to join:</u>
<u>ztfvariable@lists.caltech.edu</u>
Telecoms: Tuesdays 10am/4:30pm

machine learning